

**IN THE UNITED STATES PATENT AND TRADEMARK OFFICE**

In re Patent Application of:  
Gaur et al.

Application No.: 10/824,263

Confirmation No.: 6517

Filed: April 13, 2004

Art Unit: 1754

For: CARBON ALLOY PRODUCTS AND A  
PROCESS FOR THEIR PRODUCTION

Examiner: S. Hendrickson

**DECLARATION OF SIDDHARTHA GAUR IN SUPPORT OF RESPONSE TO OFFICE  
ACTION MAILED APRIL 28, 2010**

MS AMENDMENT  
Commissioner for Patents  
P.O. Box 1450  
Alexandria, VA 22313-1450

Dear Sir:

In support of the response to the Office Action mailed April 28, 2010 (originally mailed December 3, 2009 to an incorrect address and re-mailed April 28, 2010, hereinafter referred to as "Office Action Mailed April 28, 2010"), please reconsider this application in view of the declaration of the inventor, Siddhartha Gaur, Ph.D.

In connection with the Applicant's Response to the Office Action issued on April 28, 2010, this declaration sets forth the pertinent facts indicating that the product made by the process in Claims 31-72 of U.S. Patent Application 10/824,263 entitled "CARBON ALLOY PRODUCTS AND A PROCESS FOR THEIR PRODUCTION" filed April 13, 2004, and as currently amended in the preliminary amendment to the RCE application and response to the office action filed herewith, is different from the products disclosed in the art cited and applied in the recent Office Action.

1. I, the undersigned, Siddhartha Gaur, Ph.D. have received the B.S. Degree (1983) chemical engineering from Aligarh University, India, the M.S degree (1993) in environmental engineering from the Colorado School of Mines, Golden Colorado, and the Ph.D. degree (1989) in chemical engineering from the Indian Institute of Technology, New Delhi, India.
2. I am a listed co-inventor on U.S. Patent Application 10/824,263 entitled "CARBON ALLOY PRODUCTS AND A PROCESS FOR THEIR PRODUCTION" filed April 13, 2004.
3. I am familiar with the process of graphitization of carbon and the scientific literature indicates that, other than inconsistent bond breakage and random bond formations, the initial

stages of graphitization occur at temperatures above 1300°C and higher. Under standard atmospheric conditions, graphitization does not occur at lower temperatures.

4. I am familiar with the process of graphitization of carbon and the scientific literature indicates that the uniform single form of bonding in graphite is different from carbon alloys where "...carbons with different hybrid orbitals account as different components." (See, *CARBON ALLOYS, Novel Concept to Develop Carbon Science and Technology*, Yasuda et al., at page 9 (2003). [ IDS REF. B9]
5. I have reviewed the patent to Ubbelohde 4213956 (Ubbelohde) that was cited in the Office Action mailed April 28, 2010, and have determined that the product produced by the method described and explained by Ubbelohde will be a graphite product, produced by a process that requires graphitization, and it is a different product from the carbon alloy product produced and claimed according to the methods of Claims 31-72 of our U.S. Patent Application 10/824,263 entitled "CARBON ALLOY PRODUCTS AND A PROCESS FOR THEIR PRODUCTION."
6. I, have reviewed the patent to Ubbelohde and have further determined on information and belief that upon reading the disclosure by Ubbelohde, at column 6 lines 548-56, as follows:

"In yet another step in the method of the invention the composition containing well oriented graphite crystallites in a carbon matrix, after being subjected to pressure to orient yet further the graphite crystallites and increase the density of the composition, may be heated to high temperature e.g. to a temperature of 1000 °C to 2000 °C to more completely graphitize the carbonaceous matrix to improve the electrical properties of the composition."

It is believed that those of ordinary skill in the art to which this invention is directed will understand the foregoing to mean that further graphitization must occur in this step and thus the temperature that is within the range indicated by Ubbelohde (1000 °C to 2000 °C) must actually be in the part of that range that is at or above 1300 °C (not at 1000 °C – below 1300 °C), otherwise sufficient graphitization should not occur as it is required to do by Ubbelohde.

7. I, have reviewed the patent to Morgan 3867499 (Morgan) that was cited in the Office Action mailed April 28, 2010, and have determined that the product produced by the method described and explained by Morgan is and will be either an acrylic fiber intermediate product before graphitization, or a graphite fiber product produced by a process that requires graphitization at temperatures above 1300 °C, and it is a different product from the carbon alloy product produced and claimed according to the methods of Claims 31-72 of our U.S. Patent Application 10/824,263 entitled "CARBON ALLOY PRODUCTS AND A PROCESS FOR THEIR PRODUCTION."
8. I, have reviewed the Tither et al. article (Tither) that was cited in the Office Action mailed April 28, 2010, and have determined that the product produced by the method of vapor deposition described and explained by Tither is a thin film primarily graphite material deposited on polished substrate surfaces. While the substrate temperatures may be below 1300 °C the instantaneous temperature for vaporization in the process is not specified and for purposes of forming graphite is scientifically expected to be well above the graphite

formation temperature, and above 1300 °C. There are apparently only impurities of other forms of carbon present. The thin film graphite product formed by Tither is a different product from the carbon alloy product produced and claimed according to the methods of Claims 31-72 of our U.S. Patent Application 10/824,263 entitled "CARBON ALLOY PRODUCTS AND A PROCESS FOR THEIR PRODUCTION."

9. I, have reviewed the Tanabe article (Tanabe) that was cited in the Office Action mailed April 28, 2010, and have determined that while the article defines the term "carbon alloys" it does not indicate that any such alloys were actually possessed by the authors at the time of the article or how any such carbon alloys can be made. In particular, there is no showing of how to make any carbon alloy that does not include graphite. The concept of carbon alloys is discussed in terms of theoretical avenues for study and no method is disclosed that would allow anyone to make a carbon alloy based upon the teachings of the Tanabe article.
10. I have conducted standard Boudouard reaction tests on samples of graphite and also on different samples of carbon alloy product produced according the process described and claimed in the present patent application to show that the carbon alloy products are different and they are not graphite. The testing was conducted according to my direction and under the controlled parameters and conditions as described below. The results for determining the reactivity of two specimens of carbon alloy compared to a single standard type of industrial grade graphite obtained from NAC Carbon Products Inc. Pennsylvania. The testing was conducted as follows: The test was designed to determine the reactivity of the carbon in the sample by heating the sample in a reaction chamber in an industrial grade Nitrogen (99% pure) atmosphere up to 900 °C. Upon reaching the temperature of 900 °C, CO<sub>2</sub> (99% pure) was introduced into the reaction chamber. All through the process of heating and the isothermal temperature range, the measurement of % change in weight of the sample was recorded by the analyzer. The sample was heated to a temperature at which some reaction between the carbon in the sample and the CO<sub>2</sub> atmosphere occurs. The expected reaction may be expressed by the chemical reaction equation: C + CO<sub>2</sub> → 2CO. This reaction is commonly referred to as Boudouard's reaction in the general scientific literature. Here upon application of heat, the carbon of the sample reacts with the CO<sub>2</sub> atmosphere and gives off carbon monoxide gas into the chamber which is vented out. The loss of weight of the sample indicates how much carbon has reacted. The greater the weight loss for a given time and temperature, the greater the reactivity of the sample. At temperatures around 900 °C, the carbon in graphite state is expected to have relatively low reactivity while the carbon in non-graphitic state is expected to have higher reactivity. The greater the weight reduction of the carbon in a test sample, the greater the reactivity of the sample tested. This test can be used to show the relative reactivity of different samples of carbon materials. After the completion of the above experiment, the weight reduction of the sample was measured and the percentage weight loss due to reacted carbon was calculated. This percentage weight loss corresponds to the thermal gravimetric percentage (TG) and it corresponds to the percentage of the sample carbon weight that reacted with the CO<sub>2</sub>. The TG% was plotted on the attached test results chart as a function of the time and temperature of the carbon alloy test samples A and B compared to a similarly prepared sample of graphite. The same test procedure was repeated for nearly same size and weight sample made of carbon alloy product in each test sample A and B that was produced in each case in accordance to the variation of the process disclosed and claimed in the patent application.

11. The carbon alloy test samples A and B were prepared with the ingredients listed as part of the claims disclosed in the patent, and the process of their preparation was as per the steps and procedure disclosed in the claims. These samples were prepared by varying the mix of bituminous and sub bituminous coals, tar, coke breeze, rubber tire and polyvinyl acetate.

After cooling to room temperature the test samples were then tested for reactivity using the standard Boudouard reaction test. The results of comparison test are indicated in the comparison chart attached hereto. The results of the comparison chart comparing reactivity of graphite the carbon alloy Test Sample A and B, show that the decrease in the weight (TG%) of these samples (A&B) at 900°C in a CO<sub>2</sub> atmosphere for one hour was approximately 7% and 40% respectively. This is in contrast to a decrease in the weight of the graphite sample at the same conditions and one hour time period of only about 3.5% weight (TG%) loss. Thus the reactivity of these carbon alloy samples was significantly greater than that of graphite during the same duration of test (more than twice as large of a TG% for the carbon alloy test sample A, and ten times greater than graphite for sample B).

12. The objective of these test results is to show that the carbon alloy products produced according to the process as disclosed and claimed have significantly different reactivity, such that the carbon alloy product of the claimed inventions is demonstrably different from the graphite products of the prior art patents.

I, Siddhartha Gaur, Ph.D., hereby declare that all statements made herein of my own knowledge are true; all statements made on information and belief are believed to be true; and further that these statements were made with the knowledge that willful false statements and the like so made are punishable by fine or imprisonment, or both, under Section 1001 of Title 18 of the United States Code and that such willful false statements may jeopardize the validity of the application or any patent issued thereon.

Signed this 3rd day, of June 2010.



Siddhartha Gaur, Ph.D.

**Comparative chart for reactivity of Graphite & Carbon Alloys in 100% CO<sub>2</sub> atmosphere at 900 °C**

**(Sample A labeled as Carbon Alloy; Sample B labeled as Reactive Carbon Alloy)**

